

REMARKS/ARGUMENTS

Favorable reconsideration of this application as presently amended and in light of the following discussion is respectfully requested.

Claims 1-40 and 42-45 are presently active in this case, Claims 1, 40 and 45 amended, and Claim 41 canceled by way of the present amendment.

In the outstanding Office Action, the Restriction Requirement issued March 10, 2006 was made Final; the drawings were objected to for informalities; the specification was objected to for informalities; Claim 45 was rejected under 35 U.S.C. § 112, first paragraph; Claims 1-9 and 39 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,106,628 to Takahashi in view of U.S. Patent Publication 2002/0162835 to Toya et al.; Claim 16 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Takahashi in view of Toyo et al., and further in view of U.S. Patent 6,688,375 to Turner et al.; Claims 17, 29-31 and 41 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Takahashi in view of Toya et al. and further in view of U.S. Patent No. 6,919,538 to Szekeresch et al.; and Claim 45 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Takahashi in view of Toya et al., and further in view of U.S. Patent 6,353,209 to Schaper et al.

With regard to the objections to the drawings, attached hereto are replacement sheets for Figures 10A, 10B, 10C and 14A which address the objections to the drawings. Regarding the objection to the specification, the specification has been amended to address these objections, as well as to correct errors in the specification that made the specification inconsistent with the drawings. Thus, the objections to the drawings and the specification are believed to be overcome.

With regard to the rejection of Claim 45 under 35 U.S.C. § 112, first paragraph, Applicants have now amended Claim 45 to recite a “cooling mechanism,” as interpreted in

the Office Action. Therefore, the rejection under 35 U.S.C. § 112, first paragraph is also believed to be overcome.

Turning now to the merits, in order to expedite issuance of a patent in this case, Applicants have amended Claim 1 to clarify the patentable features of the present invention over the cited references. Specifically, Applicants' Claim 1, as amended recites a wafer heating assembly including a holding device having a wafer support surface configured to support a wafer and a backside surface opposing the wafer support surface, the holding device comprising a plurality of recesses each having a middle portion extending along the wafer support surface and end portions that extend to openings in the backside surface. Also recited is a plurality of heating units each mounted in a respective recess, wherein each heating unit includes a tube extending along the middle and end portions of the respective recess and having a carbon wire heater including a carbon fiber bundle, the carbon wire heater having a middle section sealed within the tube and opposing ends that extend to an exterior of the tube. At least one of the tube or an opposing end of the carbon wire heater extends through one of the openings in the backside surface, and connecting terminals are coupled to the opposing ends of the carbon wire heater. Finally, a mounting assembly is coupled to the holding device and configured to mount the wafer heating assembly to a processing chamber.

Thus, Applicants' Claim 1 has been amended to recite detailed structural features of the claimed wafer heating assembly, including that the plurality of recesses each have a middle portion extending along the wafer support surface and end portions that extend to openings in the backside of the surface. In contrast, the primary reference to Takahashi discloses a heater unit having a pair of annular susceptors (8 and 9) for holding and rotating a plurality of wafers 1 within a chemical vapor deposition system. As seen in Figure 1 of Takahashi, the susceptors 8 and 9 each include a simple flat surface structure mounted on

rotary shafts 6 and 7. There is no recess or heating unit of any kind within the annular susceptors 8 or 9.

Although the Office Action cites the annular grooves 14 and annular heaters 13 as meeting the claimed recesses and wire heaters, these items 13 and 14 are provided in a wall of the CVD chamber of Takahashi, which is completely separate from the susceptors 9 and 9. That is, the annular heaters 13 and annular grooves 14 are not provided as part of the holding device as now clearly required by amended Claim 1. The secondary reference to Toya et al. does not disclose a substrate holder at all, and therefore cannot correct the deficiencies of Takahashi. Thus, the combination of Takahashi and Toya et al. does not disclose a holding device having a wafer support surface configured to support a wafer and a backside surface opposing the wafer support surface, the holding device comprising a plurality of recesses each having a middle portion extending along the wafer support surface and end portions that extend to openings in the backside surface as now required by independent Claim 1.

The outstanding Office Action acknowledges that the primary reference to Takahashi does not disclose the heater unit limitations of the claim, but cites Toya et al. as teaching these limitations.<sup>1</sup> Applicants have now amended independent Claim 1 to further clarify the structure of the heating units in order to clarify distinctions over the heating units disclosed in Toya et al. Specifically, as noted above, the heating units each include a tube extending along the middle and end portions of a respective recess and a carbon wire heater including a carbon fiber bundle, the carbon wire heater having a middle section sealed within the tube and opposing ends that extend to an exterior of the tube. Also recited is that at least one of the tube or an opposing end of the carbon wire heater extends through one of the openings in the backside of the substrate holder. In contrast, Toya et al. discloses a rod-shaped heater that

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<sup>1</sup> See Office Action at page 5, lines 16 – page 6, line 9.

is intended to be directly dipped into a storage tank of wet etching agent.<sup>2</sup> As seen throughout the figures of Toya et al., the carbon wire heating element 2 and quartz glass tube 3 are provided within a large diameter glass tube numbered 4 in paragraph 69 and 70, for example. Alternatively, the carbon wire heating element and quartz glass tube can be provided in a combined sealed terminal 20 and quartz flat plate 32 as shown in Figure 13. Thus, Toya et al. does not disclose the above-noted limitations now recited in Applicants' independent Claim 1.

Finally, even assuming that all of the limitations of amended Claim 1 can be gleaned from the cited references to Takahashi and Toya et al., there is no motivation to combine these references to arrive at the present invention. As disclosed in Applicants' specification, the present invention is directed to improving a wafer heating assembly to provide more uniform heating characteristics of the wafer, reduced thermal budgets for processing the wafer, faster throughput and reduced cost of ownership of the wafer processing apparatus.<sup>3</sup> Further, the inventive wafer heater permits higher temperature ranges of operation with faster thermal gradients than a conventional heater system.<sup>4</sup> The present inventors discovered that these objectives can be provided by a wafer heater that includes a tube and carbon wire heater assembly as recited in independent Claim 1. As noted above, Takahashi discloses a CVD chamber having conventional heaters in a wall thereof, and discloses no special heating consideration of the substrate holder itself. The cited reference to Toya et al. discloses a carbon fiber heater used in a rod type heater that is submerged in an etching liquid, and does not include any disclosure of a substrate holder.

Thus, Takahashi and Toya et al. are directed to completely different problems and objectives from one another and there is no motivation to combine these references. In this regard, Applicants note that the Office Action states that the motivation to combine these

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<sup>2</sup> See Toya et al. at paragraph 6.

<sup>3</sup> See Applicants' specification at paragraph 4 and 91.

<sup>4</sup> Applicants' specification at paragraph 96.

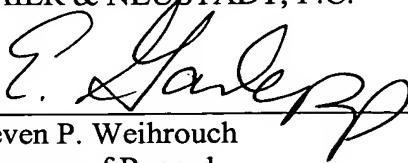
references is to “achieve more flexibility and durability of heating elements and heating uniformity. (Paragraph [0085] of Toya et al.)”. Applicants submit, however, that this motivation applies only to the heating rod disclosed in Toya et al., and cannot apply to a substrate heater as claimed in the present application. Thus, the motivation statement in the Office Action is improper and cannot support a *prima facie* case for obviousness of Claim 1, especially as amended herein.

For the reasons discussed above, Applicants’ independent Claim 1 patentably defines over the cited references to Toya et al. and Takahashi. Moreover, the remaining cited references in this case are provided for teachings of features within the dependent claims and do not correct the deficiencies noted above. Therefore, Applicants independent Claim 1 patentably defines over the cited references. Finally, as Claims 2-39 and 45 depend from Claim 1, these claims also patentably define over the cited references.

Consequently, in view of the present amendment, no further issues are believed to be outstanding in the present application and the present application is believed to be in condition for formal allowance. An early and favorable action is therefore respectfully requested.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,  
MAIER & NEUSTADT, P.C.

  
Steven P. Weihrouch  
Attorney of Record  
Registration No. 32,829

Edwin D. Garlepp  
Registration No. 45,330

Customer Number  
**22850**

Tel: (703) 413-3000  
Fax: (703) 413 -2220  
(OSMMN 03/06)

IN THE DRAWINGS

The attached sheets of drawings include changes to Figs. 10A, 10B, 10C and 14A.

These sheets, which include Figs. 10A, 10B, 10C and 14A, replace the original sheets including Figs. 10A, 10B, 10C and 14A.

Attachment: Replacement Sheets